entirely different from that of western Oregon. The prevailing characteristics of the climate of eastern Oregon are briefly these: extreme cold weather, with snow, in winter, the temperature recording as low as 20° below zero at places, and very warm and absolutely dry weather in summer.

In these reports, for the present, the climate of that portion of Oregon west of the Cascade Mountains only will be given. It is hoped that stations will soon be established in eastern Oregon, when the whole state will be represented.

The month was characterized by an excess of temperature and precipitation in the northern part of the state and along the coast, and by a deficiency of both in the southern part. The month opened with a well-marked storm off the mouth of the Columbia River. This storm was succeeded by a succession of light storms, giving almost constant rain until the 13th. From the 16th to the 23d, the weather was generally fair, broken by a light storm on the 24th, and by a severe storm on the 27th, which latter gave a copious rainfall and snow in the mountains.

Temperature (in degrees Fahr.).—The mean temperature for the state was 38.9; the maximum, 58, at Roseburg and Ashland; the minimum, 4, at Fort Klamath. The highest temperature occurred from the 1st to 18th, and the lowest from the 21st to 25th. Along the coast, in the Umpqua and Willamette valleys, the temperature was from 0.7 to 1.7 above the normal. In the extreme southern part of the state the temperature was from 2 to 5 below the normal. The last eleven days of the month were generally below the normal.

Precipitation (in inches).—The precipitation was from one to five inches above the normal along the coast and in the interior valleys, and about one inch below the normal in the southern part of the state. The greatest excess, 5.00 inches, occurred at Albany, and the greatest deficiency, 1.15 inches, at Ashland. For the season from July 1st, the precipitation is above the normal at Astoria and Albany, nearly normal at Roseburg, and below the normal in all the other districts; the greatest deficiency, 5.10 inches, being at Ashland.

Very heavy rains occurred in the northern part of the state on the 6th. Precipitation occurred on from ten to twenty-four days throughout the state.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps:

The characteristics of the weather of December were similar to those of November in the general moderation of the changes of temperature and the absence of extremes. While the mean temperature of 31°.5 is very nearly that of the absolute mean, the general climate has been mild rather than severe. The equable temperature, and the absence of heavy snowfalls during the first and middle parts of the month, have been favorable for the continuance of building operations, plowing, and the usual out-door work performed at this season of the year. The month has been favorable to the growth of winter wheat, which is reported in excellent condition. The pasturage of the lower counties has been of value.

The coldest period of the month was from the 22d to the 31st, inclusive. The lowest temperatures reported were, Dyberry, —6°, on the 31st; Lancaster, —3°.8, 29th; Wysox, 0°.5, 31st; Phillipsburg, 0°.0, 1st; Scranton, 3°.5, 1st; Pittsburg, 7°.5, 29th; Philadelphia, 14°.5, 29th. The highest temperatures occurred on the 4th, 10th, and 11th, and ranged from 50° to 60°.

Most of the high barometric pressures were on the 1st, and the lowest on 17th and 18th. The latter was attended by general rains and snows, which were heavy east of the Alleghenies.

With the exception of the 1st, 6th, and 18th rain or snow fell in measurable quantities on every day of the month in some part of the state. The total precipitation has been very unevenly distributed. In many of the eastern counties there was an excess of 100 per cent., while in the western it ranged from normal to a deficit of from 30 to 50 per cent. The following are the greatest reported: West Chester, 6.81 inches; Pottstown, 6.50 inches; Quakertown, 6.05 inches; Blooming Grove, 5.80 inches; Philadelphia. 5.06 inches. The least are: Clarion, 1.49 inches; Oil City, 1.76 inches; Uniontown, 1.69 inches, and Meadville, 1.89 inches.

Several of the western counties report much inconvenience from the continued drought.

Snows occurred from the middle to the last of the month in variable quantities, amounting to a total of about two feet in some of the northern and eastern counties. Owing to its being closely followed by rains, the snow was soon melted, and did not cause much interference with, or interruption to, travel. In the wooded districts of the state the snow has not been sufficient to enable the lumbermen to transport their logs and timber to the streams.

The prevailing winds have been from the northwest and southwest, with an absence of severe gales. More than the usual number of cloudy days have been reported. The weather summary for the month shows the following: cloudy, 16 days; fair, 9 days; clear, 6 days.

The "South Carolina Weather Service," Hon. A. P. Butler, Com'r of Agriculture for South Carolina, Columbia, director:

Most prominent during the month were the cold waves. The cold-wave signal orders, with but one exception, were fully justified, and the criticism on this particular branch is very flattering to the service, the signals having been ordered far enough in advance to satisfy all.

The areas of low barometer, appearing at different times during the month, brought with them rain, the largest amount falling in the state on the 24th of the month. The greatest amount of precipitation fell in the southern counties, and the least in the middle counties.

Summary.

Temperature (in degrees Fahrenheit).—Monthly mean, 44.9; highest monthly mean, 51.1, at Charleston; lowest monthly mean, 40.1, at Kirkwood; maximum, 76, at Spartanburg, on the 3d; minimum, 18, at Cheraw and Brewer Mines, on the 30th; range for state, 58; greatest local monthly range, 57, at Spartanburg; least local monthly range, 30, at Marion; greatest daily range, 39, at Cedar Springs, on the 3d; least daily range, 0, on the 9th at Belfast.

Precipitation, including melted snow (in inches).—Average for state, 4.65; greatest, 7.91, at Charleston; least, 3.31, at Stateburg; average number of rainy days, 9.7.

Wind.—Prevailing directions, northeast and east.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The special features for December were the heavy rainfall of the 31st and the absence of any electrical disturbance except on that day.

The mean temperature was 38°.6, about the normal for the past five years, the greatest during that period being 42°.9, in 1883, and the least, 34°.6, in 1886. The highest temperature was 65°, recorded on the 3d and 6th, and was, by several degrees, the lowest December maximum during the period above-named. The lowest temperature was zero, recorded on the 29th, and was 8° above the December minimum of 1886, 12° above the December minimum of 1883 and 1885, and 1° above the December minimum of 1884. The ranges of temperature were less than the normal.

The mean precipitation for the month was 5.05 inches, nearly one inch above the December mean of the past five years. Of this amount, the eastern division received an average of about four and a half inches; the middle division a little more than five inches, and the western division nearly five inches. The greatest local precipitation for the month was 8.70 inches, at Fostoria, and the least, 2.06 inches, at Waverly. The greatest amount in twenty-four consecutive hours was 3.88 inches, at Lawrenceburg, from 4 a. m. to 11 p. m. on the 31st. The day of the greatest rainfall was the 31st, when an average of 1.60 inches of rain fell throughout the state. Up to this date there was quite a deficiency in the rainfall for the month. The greater portion of this rain fell in the middle division. With the exception of those of the 7th, 9th, and 31st, the rains during the month were mostly light. The 1st, 12th, 18th, 21st, 22d, and 29th were reported without measurable rainfall.

Snows were reported on the 17th, 24th, 25th, 26th, 28th, and 30th, and were generally light, the greatest depth reported being 4.50 inches at Greenville and Andersonville. Very little fell in the middle and western divisions. The snowfall during the year was very small compared with the four preceding years.

NOTES AND EXTRACTS.

OCEAN FOG PREDICTIONS.

[By E. B. GARRIOTT, Sergeant, Signal Corps.]

It is interesting to note that the comments which have been made in the WEATHER REVIEW on the subject of ocean fog have been consistent with the facts deduced from special fog reports made by shipmasters during the past fourteen months. This system of reports was inaugurated to verify the theory that in the passage of low barometer areas over or near the Banks of Newfoundland, meteorological conditions favorable to the precipitation of fog atoms are developed, and the reports of each succeeding month have not only verified the correctness of this theory, but have also served to establish the fact, to which few, if any, exceptions have been noted, that the development of fog near Newfoundland attends the circulation of winds in the southern quadrants of low barometer areas. With a knowledge of this fact the practicability of forecasting the presence of fog over the Banks is limited only by the difficulties which may attend the forecasting of the passage of low barometer areas over or near that region. The extent to which these difficulties are surmountable can be readily determined by a study of the storms which first appear over the American continent or over the ocean west of the sixtieth meridian. Of the first-named class of storms it is known that those of marked energy commonly move eastward over the Gulf of Saint Lawrence or the Atlantic coast to the southward; in the case of storms of tropical or sub-tropical origin which advance along the course of the Gulf Stream, it has been found that their progress is usually indicated by telegraphic reports from coast stations. The storm-track charts also show that the normal paths of all storms which develop west of the sixtieth meridian traverse the region which embraces or immediately adjoins Newfoundland and the Grand Banks. It would therefore appear that of the preliminary knowledge necessary to the successful making of fog predictions there remains to be determined, through the experience and current work of the Signal Office, the storms which, appearing over the interior of the country, are likely to move eastward over the coast line, or, on being located off the lower coast, possess sufficient strength to

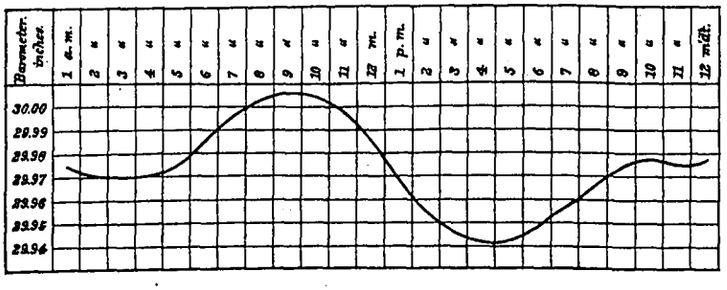
advance northeastward to the vicinity of Newfoundland. As these movements are calculated tri-daily, there are, apparently, no elements of theory or fact wanting to successfully forecast fog for the Banks of Newfoundland for periods of from four to five days.

MEAN HOURLY VARIATIONS OF ATMOSPHERIC PRESSURE.

Hourly observations of the barometer were taken at the office of the Chief Signal Officer in Washington City from May 1, 1887, until the close of the year. Means for the several hours for each month and for the entire period, determined from observations taken daily at the same hour, are given in the following table, together with monthly means computed from the twenty-four daily observations:

Hour of observation.	May.	June.	July.	August.	September.	October.	November.	December.	Means for period of 8 months.
1 a. m.	29.948	29.937	29.908	29.903	30.039	29.975	30.009	30.078	29 975
2 a. m.	29.944	29.933	29.900	29.898	30.030	29.974	30.010	30.079	29.971
3 a. m.	29.943	29.937	29.895	29.898	30.029	29.968	30.008	30.081	29.970
4 a. m.	29.947	29.939	29.895	29.899	30.033	29.968	30.006	30.077	29.970
5 a. m.	29.954	29.940	29.906	29.904	30.040	29.976	30.006	30.074	29.975
6 a. m.	29.966	29.954	29.912	29.914	30.051	29.980	30.017	30.078	29.984
7 a. m.	29.976	29.957	29.916	29.922	30.062	29.997	30.031	30.088	29.994
8 a. m.	29.981	29.964	29.922	29.930	30.061	30.012	30.046	30.094	30.001
9 a. m.	29.982	29.967	29.925	29.928	30.074	30.017	30.054	30.103	30.006
10 a. m.	29.979	29.966	29.926	29.928	30.072	30.012	30.053	30.105	30.005
11 a. m.	29.974	29.964	29.924	29.924	30.065	30.004	30.044	30.095	29.999
12 m.	29.963	29.958	29.915	29.913	30.054	29.987	30.022	30.074	29.986
1 p. m.	29.949	29.945	29.901	29.902	30.038	29.965	30.006	30.054	29.970
2 p. m.	29.936	29.934	29.885	29.889	30.020	29.951	29.993	30.043	29.956
3 p. m.	29.922	29.922	29.875	29.878	30.010	29.945	29.993	30.040	29.948
4 p. m.	29.916	29.911	29.864	29.871	30.002	29.941	29.991	30.041	29.942
5 p. m.	29.915	29.903	29.861	29.872	29.999	29.944	29.998	30.048	29.942
6 p. m.	29.915	29.906	29.866	29.872	30.004	29.953	30.012	30.056	29.948
7 p. m.	29.924	29.909	29.874	29.883	30.010	29.962	30.024	30.065	29.956
8 p. m.	29.931	29.920	29.880	29.898	30.024	29.968	30.030	30.066	29.965
9 p. m.	29.938	29.933	29.898	29.908	30.032	29.975	30.034	30.068	29.973
10 p. m.	29.944	29.940	29.903	29.911	30.034	29.979	30.038	30.068	29.977
11 p. m.	29.943	29.941	29.903	29.910	30.034	29.974	30.051	30.064	29.976
12 midnight	29.942	29.942	29.903	29.914	30.032	29.974	30.044	30.071	29.978
Monthly mean.	29.947	29.938	29.898	29.903	30.035	29.975	30.021	30.071	29.974
Difference between highest and lowest hourly means	.067	.063	.065	.059	.075	.076	.063	.065	.067

The diagram given below illustrates the mean hourly variations of pressure, the scale being such as to permit a close approximation of the actual figures on which it is based. It will be seen that the daily maximum occurs about 9 a. m. and the daily minimum from 4 to 5 p. m., while a second maximum, about .028 inch lower than that at 9 a. m., occurs from 10 p. m. to midnight, and a second minimum, .028 inch higher than at 4 to 5 p. m., occurs from 3 to 4 a. m.



This series of hourly observations shows that one daily observation taken at either 5 a. m. or 9 p. m. gives a monthly mean which very nearly corresponds with that determined from the twenty-four hourly observations, the former giving a mean .001 inch higher, and the latter .001 inch lower, while the mean of two daily observations, taken at the hours named, exactly corresponds with the true mean. A mean determined by the formula: ⅛ 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. also gives a result which coincides with the mean of the hourly observations, and the formula ¼ 7 a. m. + 3 p. m. + 10 p. m. gives a result .001 inch lower. Hence it is shown that the best method of obtaining a monthly mean from one observation daily is by taking the observation either at 5 a. m. or 9 p. m.; the best mean from two daily observations being either ½ 5 a. m. + 9 p. m., or ½ 8 a. m. + 6 p. m., the latter combination recommending itself as the more desirable on account of the convenient hours of observation; from three observations, ⅛ 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. With respect to the method of obtaining means from two observations taken at hours of the same name, *i. e.*, 1 a. m., 1 p. m., etc., it is shown by this series of hourly observations that 7 a. m. and 7 p. m. give the best result, the mean of these two observations being within .001 inch (higher) of that of the twenty-four hourly observations. Means obtained by combinations of observations at two hours of the same name show that from 1 to 6 o'clock, a. m. and p. m., they are too low, while from 7 to 12 o'clock, a. m. and p. m., they are too high; the 4 a. m. and 4 p. m. combination gives the minimum, and the 10 a. m. and 10 p. m. the maximum, these means being .018 inch and .017 inch, respectively, below and above the mean of the twenty-four daily observations.

Tables showing monthly and annual mean temperatures (in degrees Fahr., and precipitation (in inches and hundredths) at New Ulm, Austin Co., Tex., from observations of Mr. C. Runge, voluntary observer, Signal Service)

TEMPERATURE.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1872	.....	.....	.....	.....	.....	.....	84.3	83.4	**81.1**	70.4	54.4	47.1	.....
1873	47.3	58.1	63.6	65.7	73.7	79.1	**80.7**	**84.4**	77.2	**65.8**	59.7	56.2	67.6
1874	54.4	55.6	65.2	**68.6**	74.2	80.1	82.3	82.5	76.3	70.1	63.3	57.4	68.8
1875	43.8	56.6	61.4	65.2	74.9	80.6	82.8	82.4	75.7	68.8	62.2	**60.9**	67.9
1876	59.6	59.1	59.6	69.1	74.4	79.8	83.2	83.8	**75.6**	70.1	56.6	**46.1**	68.1
1877	48.2	55.3	62.7	67.7	73.2	**78.2**	81.2	82.8	79.4	69.6	56.0	55.4	67.5
1878	50.6	55.6	67.8	**71.5**	76.0	81.6	83.1	80.9	77.5	71.6	61.1	48.2	68.8
1879	52.5	55.0	**68.4**	70.3	**77.4**	81.4	**85.0**	**79.4**	78.4	70.9	**65.6**	58.3	**70.2**
1880	**63.7**	56.4	60.8	**71.5**	75.7	79.9	80.6	82.4	76.1	66.0	**49.6**	51.4	67.8
1881	**43.2**	53.3	62.4	69.0	76.2	**85.0**	84.1	82.8	79.2	**73.9**	58.6	57.2	68.7
1882	55.8	**62.0**	66.4	71.2	73.7	80.3	82.0	**79.4**	76.8	73.3	60.5	54.2	69.6
1883	47.2	**52.6**	62.4	69.8	73.6	80.7	82.0	83.4	76.4	72.9	61.6	53.2	68.1
1884	44.0	56.3	63.4	65.0	72.2	79.0	84.2	82.6	80.0	69.9	57.9	.....	.....
1885	.....	.....	**58.0**	69.3	**72.0**	**81.2**	81.5	83.6	77.8	66.4	61.2	54.4	.....
1886	43.6	54.2	58.7	66.6	76.1	81.7	83.4	84.0	77.8	69.1	58.7	52.7	**67.2**
1887	49.6	59.2	64.2	68.9	75.1	79.2	83.3	83.4	78.3	67.0	59.8	48.8	68.1
Mean..	50.2	56.4	63.0	68.3	74.6	80.5	82.7	82.6	77.7	69.7	59.2	53.6	.....

PRECIPITATION.

1872	.....	.....	.....	.....	.....	.....	0.90	2.53	**0.90**	4.30	4.25	6.65	.....
1873	6.50	2.15	4.80	8.00	7.88	**11.3**	**14.4**	4.48	8.95	5.10	**14.9**	3.08	**91.1**
1874	2.23	6.94	8.45	4.30	2.90	3.76	6.46	1.96	**15.1**	0.79	5.81	8.96	67.64
1875	3.68	7.00	2.56	5.06	4.23	1.89	2.13	0.90	12.49	3.54	3.50	**16.4**	63.41
1876	3.43	2.46	7.15	1.08	6.13	3.23	8.13	2.60	3.53	1.73	1.13	2.63	43.23
1877	1.13	6.75	4.25	5.94	4.50	9.00	2.10	0.55	2.38	11.31	6.04	5.35	59.30
1878	4.88	3.56	2.35	1.88	3.56	4.38	5.44	8.38	5.06	1.19	6.96	5.00	52.84
1879	4.38	1.13	3.90	**6.44**	3.19	3.06	2.00	4.19	3.44	4.00	0.78	2.59	39.16
1880	6.44	7.15	9.13	4.13	6.22	4.59	8.75	4.06	4.25	3.50	8.63	0.44	67.20
1881	1.75	8.31	2.44	2.75	4.63	0.63	5.69	**5.63**	3.41	**12.4**	8.75	3.56	59.99
1882	**10.6**	**10.9**	4.81	2.94	12.25	0.81	2.44	4.63	3.88	5.94	7.63	2.25	**69.1**
1883	7.72	4.31	**13.1**	2.54	3.07	3.38	1.22	2.19	7.71	3.51	5.32	2.61	56.71
1884	3.43	2.58	4.86	4.68	**15.2**	2.82	**0.00**	0.21	5.18	1.78	5.05	**T.**	45.84
1885	**T.**	**1.06**	2.14	5.71	8.01	**0.51**	3.24	**0.09**	3.51	1.93	0.89	3.75	30.84
1886	1.13	1.65	4.75	2.01	**0.05**	0.68	2.10	4.64	7.81	**0.92**	1.50	0.97	28.21
1887	1.09	2.00	**1.27**	**0.17**	3.56	2.24	2.76	1.72	3.26	2.70	**0.18**	4.97	**26.2**
Mean..	4.13	4.53	5.07	3.84	5.70	3.49	4.23	3.05	5.68	4.04	5.10	4.62	.....

Precipitation, in inches and hundredths, by months and years, at Fort Gibson, Indian Territory.

Lat. 35° 50′, Long. 95° 20′.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1836	.....	.....	.....	.....	.....	.....	3.10	5.90	8.04	3.05	2.08	1.20	.....
1837	3.01	1.00	1.90	4.30	4.45	6.10	2.46	0.50	6.72	0.52	3.30	0.40	34.66
1838	0.80	0.20	1.01	1.20	4.11	2.04	0.80	1.06	0.52	2.36	2.82	1.92	18.84
1839	2.36	1.45	1.35	2.10	1.10	4.65	*2.97	*2.69	*2.56	9.10	1.40	2.50	34.23
1840	4.08	1.20	1.40	12.55	10.13	3.30	7.10	0.84	0.81	8.50	3.91	2.00	55.82
1841	3.23	0.60	4.90	2.35	2.83	2.09	1.41	2.56	2.43	4.50	8.15	1.20	36.25
1842	1.10	1.00	0.30	4.10	5.40	4.75	2.60	3.60	0.60	1.81	1.20	2.60	29.11
1843	7.40	0.70	1.31	2.71	2.59	3.32	2.30	8.18	2.11	2.15	1.94	0.90	35.61
1844	0.76	6.07	1.91	9.62	8.46	3.15	0.64	1.98	0.76	3.28	0.87	0.08	37.58
1845	1.36	0.80	2.95	8.08	2.01	2.18	1.45	1.63	1.44	3.49	0.85	0.03	26.67
1846	1.02	1.54	1.79	3.04	4.60	6.92	0.70	1.40	4.76	0.67	2.53	4.88	33.85
1847	0.10	2.12	1.42	3.10	1.35	3.88	1.89	1.78	0.95	3.10	3.35	1.06	24.10
1848	1.05	0.20	3.12	5.21	4.52	4.50	6.98	0.00	0.35	5.25	1.90	4.65	37.73
1849	2.19	0.88	4.90	2.17	7.52	9.17	8.72	3.70	2.05	4.05	4.49	2.90	52.65
1850	1.40	3.17	4.91	4.73	0.37	4.58	1.00	3.00	0.35	3.75	4.75	3.00	35.00
1851	0.50	10.42	1.50	0.50	3.20	6.45	1.25	1.15	3.14	9.35	7.10	7.70	52.46
1852	1.58	5.67	2.24	2.95	6.72	5.85	6.12	4.99	4.38	5.50	4.91	0.74	51.65
1853	0.82	2.27	1.06	3.52	6.65	1.60	0.76	4.72	1.35	1.13	1.30	0.70	25.88
1854	0.30	1.43	7.83	3.16	7.67	2.80	0.21	0.33	0.68	1.58	2.06	0.77	28.82
1855	0.93	0.48	0.57	3.63	5.65	4.85	0.74	5.34	4.13	2.35	4.50	2.49	35.66
1856	5.05	5.25	*2.52	5.70	2.75	1.75	0.76	3.50	1.80	6.00	1.20	3.10	39.98
1857	2.20	.....	1.48	.....	.....	0.00	.....	.....	.....	.....	.....	.....	.....
1873	*2.03	*2.28	*2.52	4.59	4.56	2.93	2.38	1.56	7.28	2.80	1.97	3.66	38.56
1874	3.69	3.44	2.91	5.83	3.54	3.38	1.99	1.54	4.41	0.81	4.04	2.70	38.88
1875	0.64	0.73	2.48	8.74	5.59	3.52	10.93	4.27	1.34	1.19	2.26	2.41	44.10
1876	4.94	0.64	5.67	1.85	1.94	0.82	6.00	0.94	2.43	1.10	2.89	0.20	35.48
1877	0.29	1.47	2.27	7.77	4.82	7.74	2.89	3.78	2.21	6.36	4.19	3.00	46.79
1878	2.79	2.40	1.44	2.83	7.52	6.01	4.68	1.70	2.32	1.53	0.35	2.53	36.70
1879	3.04	1.44	0.72	4.92	4.54	1.96	1.65	4.75	0.86	1.48	3.67	4.00	33.09
1880	0.30	1.94	4.40	2.44	2.64	4.26	3.61	2.82	1.89	3.22	2.34	0.68	30.54
1881	1.76	4.14	2.28	2.64	6.96	3.80	0.76	T.	2.79	6.67	3.13	2.92	37.85
1882	2.23	3.45	2.99	1.24	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	.....	.....	.....	.....	0.55	3.00	3.25	3.00	3.75	2.75	0.50	0.04	.....
Means.	2.03	2.28	2.52	4.25	4.49	4.13	2.97	2.69	2.56	3.55	2.92	2.16	36.55

* Interpolated.